Generations and Classifications of Computer

Lecture 8

Computer Generations

- "Generation" in computer talk is a step in technology. It provides a framework for the growth of computer industry

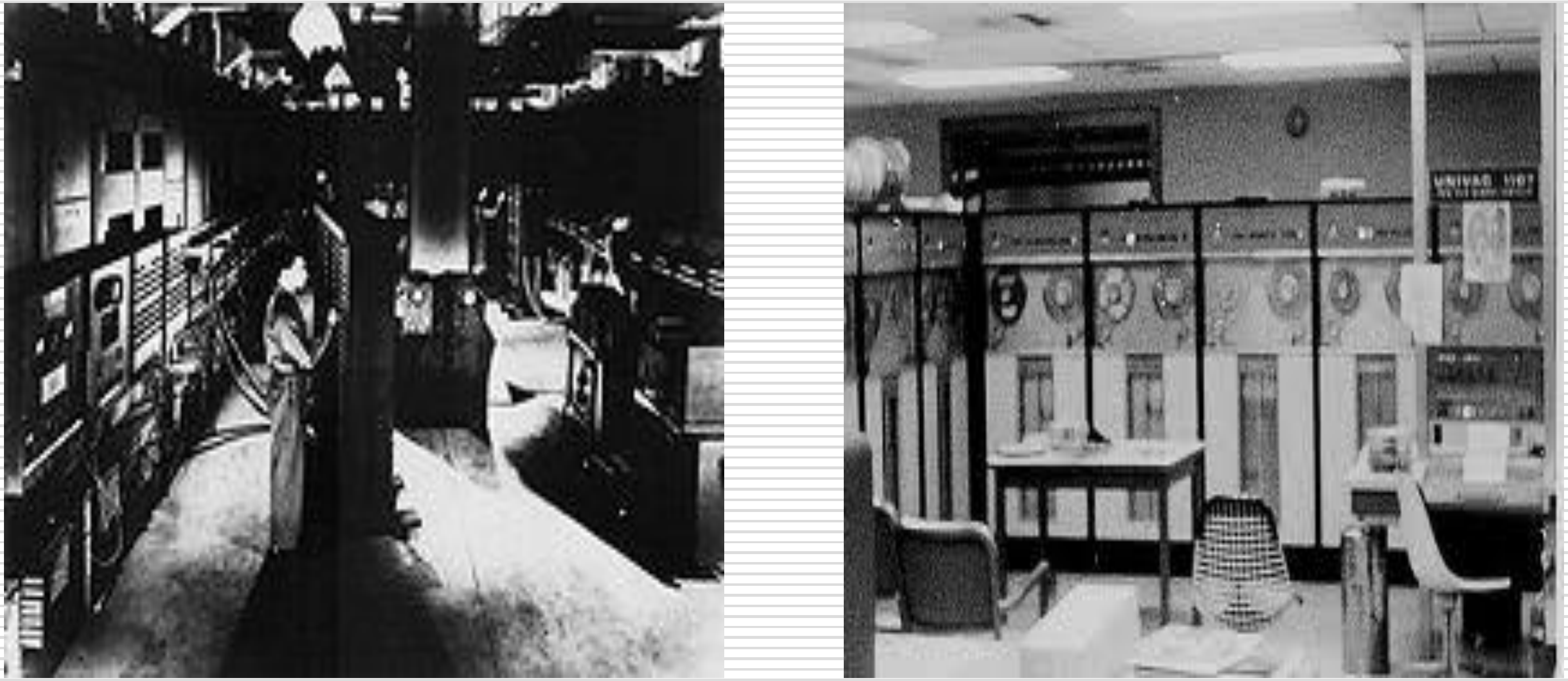
- Originally it was used to distinguish between various hardware technologies, but now it has been extended to include both hardware and software

- Till today, there are five computer generations

First Generation (1940-1956) Vacuum Tubes

- The first computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. They were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions.
- First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time. Input was based on punched cards and paper tape, and output was displayed on printouts.
- The UNIVAC and ENIAC computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.

First generation computers



Second Generation (1956-1963) Transistors

- Transistors replaced vacuum tubes in the second generation of computers. The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors.
- Second-generation computers still relied on punched cards for input and printouts for output.
- Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words.
- The first computers of this generation were developed for the atomic energy industry.
- IBM 7000, NCR 304, IBM 650, IBM 1401, ATLAS and Mark III are the examples of second generation computers.

Second generation computers

Third Generation (1964-1971) Integrated Circuits (IC)

- The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which significantly increased the speed and efficiency of computers.
- Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.
- PDP-8, PDP-11, ICL 2900, IBM 360 and IBM 370 are the examples of third generation computers.

Third generation computers

Fourth Generation (1971-Present) Microprocessors

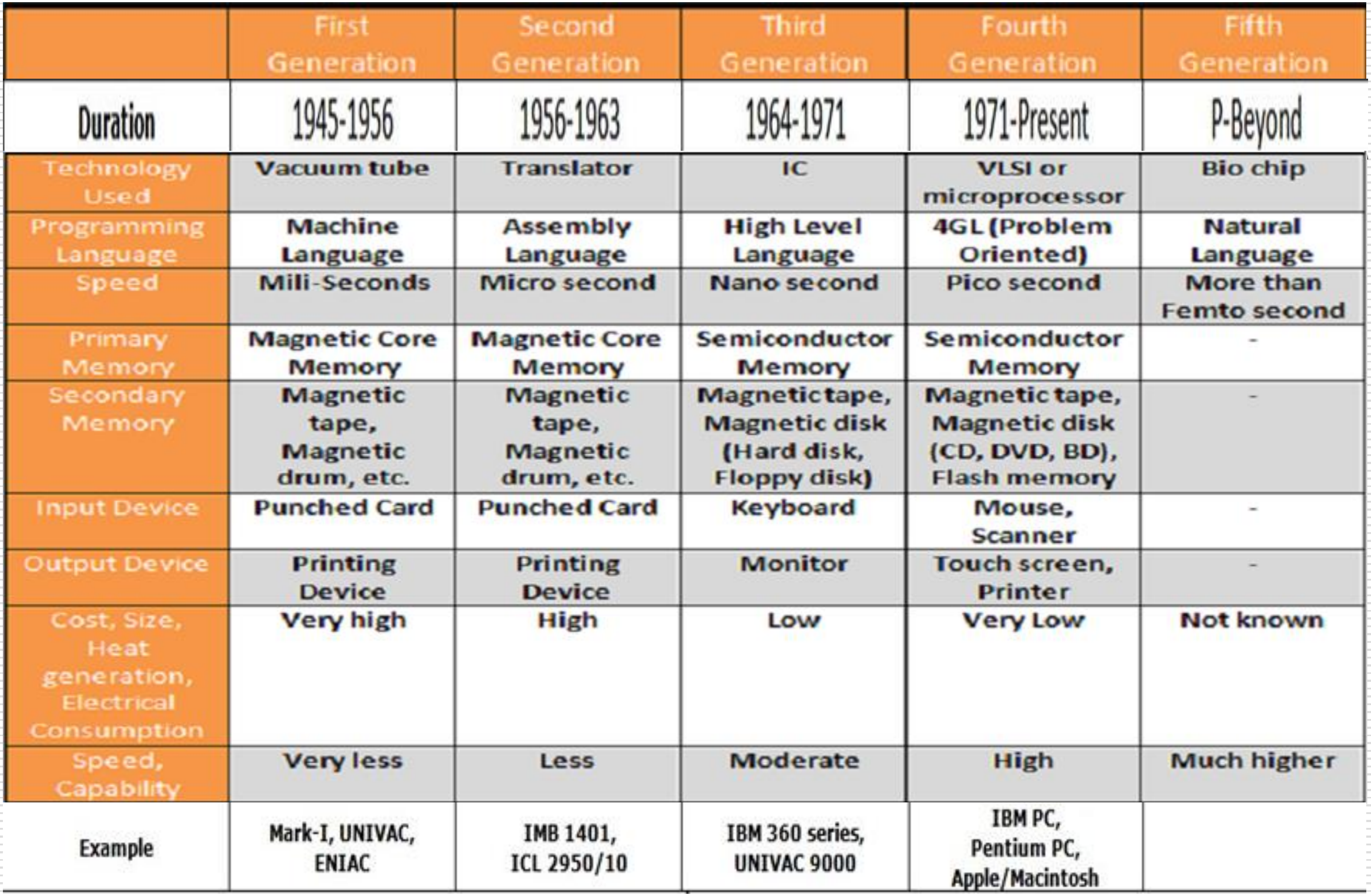
- The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. The first microprocessor Intel 4004 chip, developed in 1971, located all the components of the computer—from the central processing unit and memory to input/output controls—on a single chip.
- In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh. Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.
- As these small computers became more powerful, they could be linked together to form networks. Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.
- IBM 4341, DEC 10, STAR 1000, PUP 11 and APPLE II are the examples of fourth generation computers.

Fourth generation computers

Fifth Generation (Present and Beyond) Artificial Intelligence

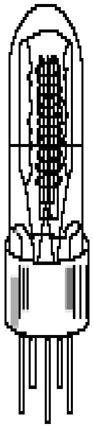
- Fifth generation computers are in developmental stage which is based on the artificial intelligence.
- The goal of the fifth generation is to develop the device which could respond to natural language input and are capable of learning and self-organization.
- Quantum computation and molecular and nanotechnology will be used in this technology. So we can say that the fifth generation computers will have the power of human intelligence.

Summary of Computer Generation

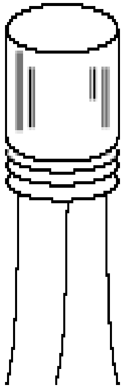


	First Generation	Second Generation	Third Generation	Fourth Generation	Fifth Generation
Duration	1945-1956	1956-1963	1964-1971	1971-Present	P-Beyond
Technology Used	Vacuum tube	Translator	IC	VLSI or microprocessor	Bio chip
Programming Language	Machine Language	Assembly Language	High Level Language	4GL (Problem Oriented)	Natural Language
Speed	Mili-Seconds	Micro second	Nano second	Pico second	More than Femto second
Primary Memory	Magnetic Core Memory	Magnetic Core Memory	Semiconductor Memory	Semiconductor Memory	-
Secondary Memory	Magnetic tape, Magnetic drum, etc.	Magnetic tape, Magnetic drum, etc.	Magnetic tape, Magnetic disk (Hard disk, Floppy disk)	Magnetic tape, Magnetic disk (CD, DVD, BD), Flash memory	-
Input Device	Punched Card	Punched Card	Keyboard	Mouse, Scanner	-
Output Device	Printing Device	Printing Device	Monitor	Touch screen, Printer	-
Cost, Size, Heat generation, Electrical Consumption	Very high	High	Low	Very Low	Not known
Speed, Capability	Very less	Less	Moderate	High	Much higher
Example	Mark-I, UNIVAC, ENIAC	IMB 1401, ICL 2950/10	IBM 360 series, UNIVAC 9000	IBM PC, Pentium PC, Apple/Macintosh	

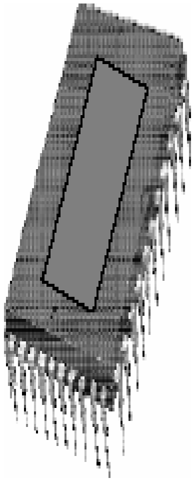
Electronic Devices Used in Computers of different Generations



(a) A Vacuum Tube



(b) A Transistor



(c) An IC Chip

(d) Microprocessor

Classification of Computers

Computer system can classify based on following points of view:

- According to Working principle
- According to size and capacity
- According to Application

Classification of Computers (cont…)

According to working principle computer can classify –

- Analog Computer
- Digital Computer
- Hybrid Computer

Analog Computer

- An analog computer is a form of computer that uses continuous physical quantities to model the problem being solved.
- It represents physical quantities, such as sound, light, temperature, pressure, force etc.
- An automobile speedometer is an example of an analog computing device.

Digital Computer

- Digital refers to communications signals or information that is represented in a binary or two state ways (on/off). The “on” state can be coded as the digit 1 and the “off” state as the digit 0.
- A computer that processes information in digital form is called digital computer.
- Example: Personal Computer (PC).

Hybrid Computer

- Desirable features of analog and degital computers are sometimes combined to create a hybrid computer system.
- In many case, a hybrid computer is an analog computer controlled by a digital computer instead of by a human.
- For example, in a hospital intensive care unit, an an analog device may mesure a patient’s heart functioning, temperature, and other quantities. These measurements may then be converted into numbers and supplied to a digital computer.

Classification of Computers (cont…)

According to size and capacity computer can classify –

- Super Computer
- Mainframe Computer
- Mini Computer
- Micro Computer

Super Computer

- The most powerful computers made.
- Handle large and complex calculations.
- Process trillions of operations per second.
- Mainly used for weather forecasting, human genome mapping, space administration, research organizations, etc.

Cray T90 Supercomputer

Mainframe Computer

- Mainframe Computer is a powerful large computer used by many people in a large business or organization.
- Handle thousands of users.
- Users access through a terminal.
- Mainly used for Corporate Data Warehouses, Web servers, etc.

Mainframe Computer

Mini Computer

- Mini Computers are powerful midsize computers.
- Power between mainframe and desktop.
- Handle hundreds of users.
- Users access through a terminal.
- Mainly used in smaller organizations, Departmental computing, Factory Automation, etc.

Mini Computer

Micro Computer / PC

- Micro Computer is a small computer usually used by one person.
- PC includes desktop, notebook or laptop, handheld PC such as a PDA (Personal Digital Assistant).

Micro Computer / PC

Classification of Computers (cont…)

According to Application computer can classify –

- General Purpose Computer/Universal Computer
- Special purpose Computer

General Purpose Computer

- General purpose computers are used to handle a variety of tasks. This is possible by the stored program concept. That is, the same hardware can be used to execute many different programs.

- General purpose computers are more versatile than special purpose computers. But typically general purpose computers are less efficient and slower than special purpose computers when applied to the same task.

Special purpose Computer

- A special purpose computer is designed for a specific application. It is also known as dedicated computer. Many such computers have instructions permanently programmed into them that are designed to perform only one major function.

- Special purpose computers are used to control traffic lights, to control the collection of tolls on highways, and in automobiles and games etc.

Generations of Programming Languages

There are five generations of programming languages:

- ☐ Machine Language
- ☐ Assembly Language
- ☐ High Level (procedural) Language
- ☐ Very High Level (nonprocedural) Language
- ☐ Natural Language

Machine Language

- First generation languages, also known as machine languages or low-level languages.
- Machine language is the basic language of the computer, representing instructions and data as binary digits (0/1).
- Machine language programs are machine dependent; that is, they run only on the computer for which they were designed.

Assembly Language

- Assembly languages, also known as second generation languages.
- Assembly languages use symbols as abbreviations for major instructions instead of long combination of binary digits.
- For example, it is much easier to remember L for Load, A for Add, B for Branch and C for Compare then the binary equivalents.

High Level Language

- The third generation languages, also known as high-level languages, are very much like everyday text and mathematical formulas in appearance.
- They are designed to run on a number of different computers with few or no changes.
- The most commonly used high level programming languages are COBOL, FORTRAN, BASIC and C.

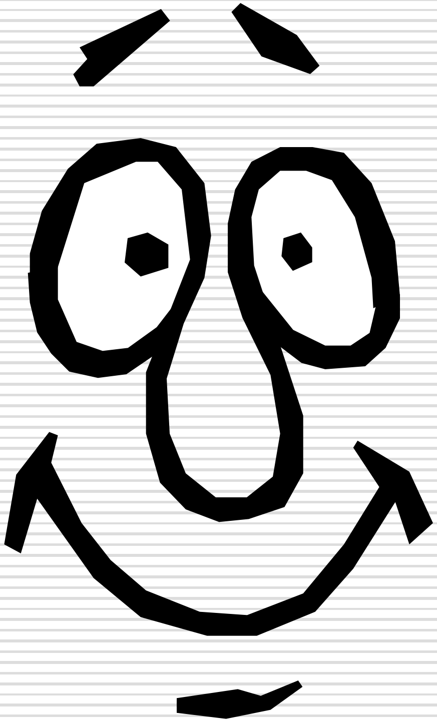
Very High Level Language

- The forth generation languages, also known as very high level language or problem oriented languages.
- The **fourth generation languages**, consist of statements similar to statements in a human language. Fourth generation languages are commonly used in database programming and scripts.
- Query languages, Report generators, Application generators are also considered as forth generation languages.

Natural Language

- A computer language that includes the most advanced concepts in computer programming and programming languages in use today, concepts such as those used in expert systems, knowledge-based systems, inference engines, natural language processing, and virtual reality.

Any Questions?



Thanks to All